FIRE

6

Role of Fire in Yellowstone

- Fires have always occurred periodically in the Yellowstone ecosystem.
- Lightning starts many fires each year that go out on their own.
- Vegetation in this ecosystem is adapted to fire.

Factors Affecting Size & Severity

- Type of vegetation where the fire begins.
- In a forested area, the interval since the last stand-replacing fire.
- Fuel moisture in the dead and down logs.
- Length of drought.
- Temperatures and humidity.
- Wind.

Extensive, on-going research is revealing Yellowstone's long and complicated fire history. By measuring the amount and age of charcoal in lake sediments, scientists now have proof that large fires have been occurring in Yellowstone since forests became established following the last glacial retreat 14,000 years ago. By examining fire scars on old Douglas-fir trees in the northern range, they see indications that fire occurs in the sagebrush/steppe on average every 25 to 30 years. And their study of tree-rings show different intervals for lodgepole pine forests, depending on soil: 150 years or more on andesitic soils; 300 years on rhyolitic soils. In addition, records kept from 1931 show that lightning started an average of 22 fires each year until the 1990s, when fire average began increasing. This may be due, in part, to climate change. *(See Chapter 8.)*

The vegetation in the Greater Yellowstone Ecosystem has adapted to fire and in some cases is dependent on it. Some plant communities depend on the removal of the forest overstory to become established; they are the first to inhabit sites after a fire. Other plants growing on the forest floor are adapted to survive at a subsistence level for long periods of time until fires open the overstory.

Fire can limit trees in the grasslands of Yellowstone, such as the Lamar and Hayden valleys. Trees such as Douglas-fir seeds require conditions that exist only in rare microhabitats in these grasslands. If a seed reaches such a microhabitat during a favorable year, a seedling may develop. Once the tree is growing, it begins to influence the immediate environment. More tree habitat is created and a small forest island eventually appears. Periodic fire kills the small trees before they have a chance to become islands, thus maintaining the grassland.

Older Douglas-fir trees are adapted to fire by having thick bark that resists damage by surface fires. In the past, in areas like the park's northern range, frequent surface fire kept most young trees from becoming part of the overstory. The widely scattered, large, fire-scarred trees in some of the dense Douglas-fir stands in the northern range are probably remnants of these communities.

Lodgepole pines produce two types of cones, one of which opens

A serotinous cone from a lodgepole pine, opened by fire.

Moisture Content

When the moisture content of down and dead lodgepole pines is:

- *<13%: lightning will likely start fires that can spread rapidly*
- *13 to 20%: fires may burn actively and possibly spread rapidly*
- *21–24%: fires may start but few will spread*
- *>24%: few fires start*

and releases seeds after being heated to at least 113°F. These fire-dependent cones—called serotinous *(photo, previous page)*—ensure seedlings become established after a fire. Lodgepole seedlings need an open canopy that allows plenty of sun through. This happens only if mature trees in a lodgepole stand are periodically thinned by disease, insects, fire, or other natural agents. Such disturbances create a landscape more diverse in age, which reduces the probability of disease or fire spreading through large areas.

Fire influences the rate minerals become available to plants by rapidly releasing these nutrients from wood and forest litter. Fire's heat may also hasten the weathering and release of soil minerals. Following a fire, plants absorb this abundant supply of soluble minerals.

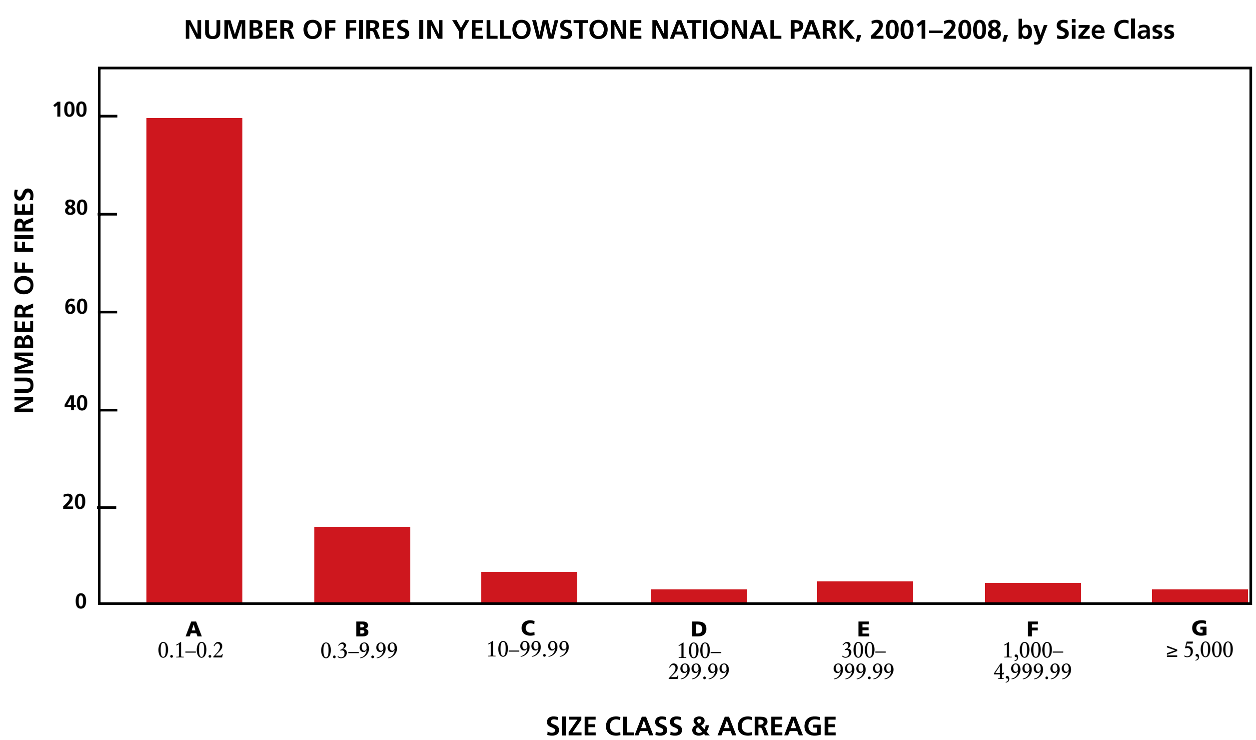
Fire suppression alters these natural conditions. Landscape diversity diminishes, and plant community structure and composition change. Diseases and insect infestations spread over greater areas, litter and deadfall accumulate, and minerals remain locked up or are more slowly released.

Fire Behavior

The moisture content of dead and down lodgepole pines and the year's weather trends are the main factors determining the severity of a given fire season. While fires can occur no matter the fuel moisture, many times conditions are too wet for fires to burn. In fact, 85 percent of all lightning-caused fires burn less than one acre. However, when fuel moisture falls below 13 percent *(see at left)*, fires that begin in older forests (>200-yr old) can grow quickly. If extreme drought continues, all forest types and ages are more likely to burn.

Fire managers may be able to predict a fire's behavior when they know where the fire is burning (older forest, grassland, etc.) and the fuel moisture content. However, predicting fire is much more difficult during extreme drought, such as was experienced in 1988 and in the 2000s.

Ongoing research in Yellowstone is also showing that forests experiencing stand-replacing fires can then affect fire behavior



Some fires burn with extreme fire behavior and rapid rates of spread. These large, fast moving fires send plumes of smoke thousands of feet into the air and receive much of the public's attention. These large fires (>100 acres) occur less than 11 percent of the time. Seventy-two percent of fires that occur in this park are less than 0.2 acres and another 12 percent range from 0.3 to 9.9 acres. These smaller, less intense fires play a role in this ecosystem by helping to thin out smaller trees and brush and boost the decay process that provides nutrients to the soil.

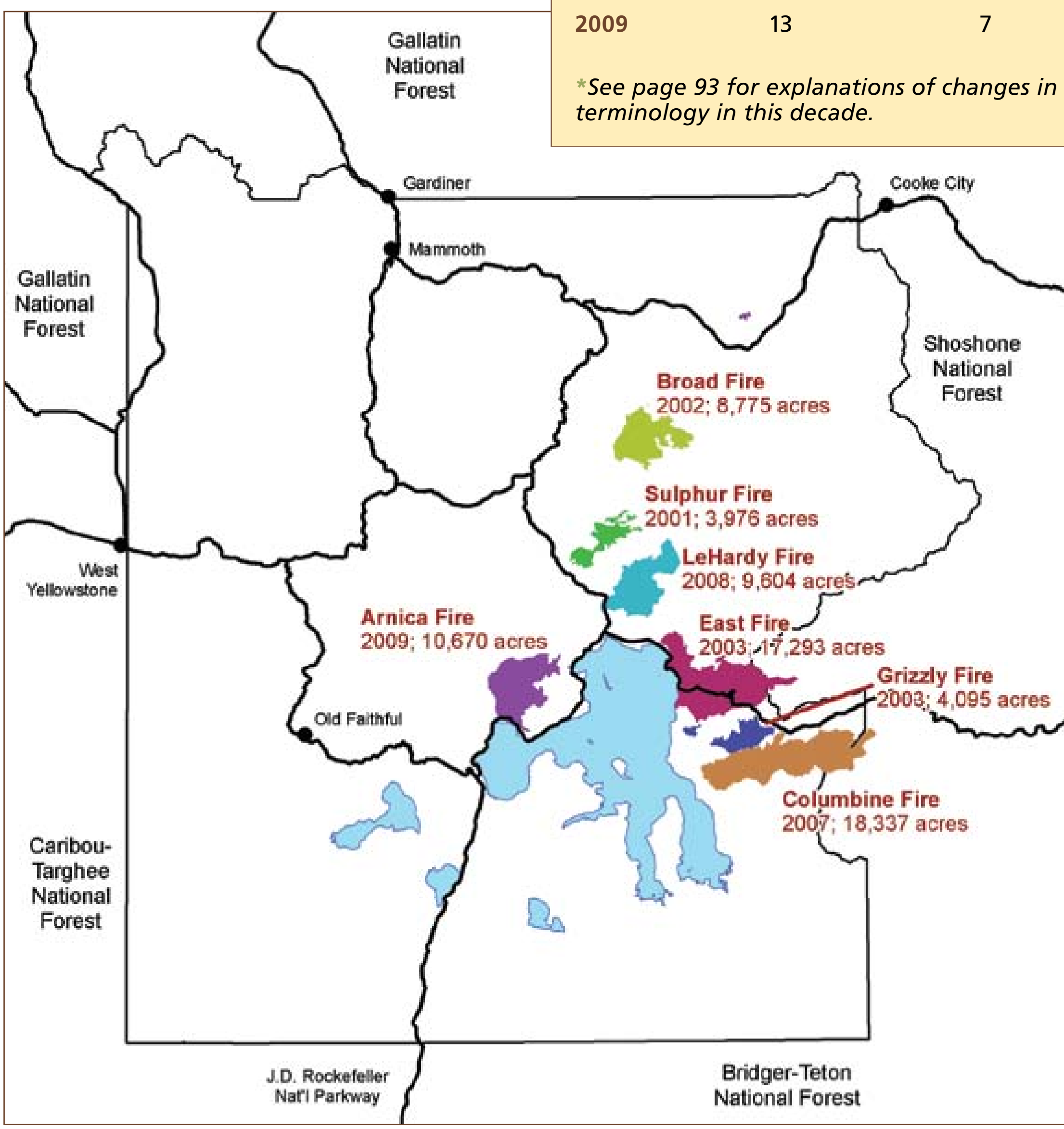
for up to 200 years. As a fire encounters the previously burned forest, its intensity and rate of spread decrease. In some cases, the fire moves entirely around the burned area. Thus, fire managers have another tool for predicting fire behavior: They can compare maps of previous stand-replacing fires with a current fire's location to predict its intensity and spread.

Major Fire Years in Yellowstone Since 2000

Year	*Managed Fires	Suppressed Fires	Acres Affected
2000	2	31	7,209
2001	16	21	7,987
2002	8	38	12,755
2003	7	71	28,849
2006	8	6	4,247
2007	9	18	24,601
2008	1	7	10,381
2009	13	7	10,898

*See page 93 for explanations of changes in fire management and terminology in this decade.

Fires Visible from Park Roads



Compare the fire perimeters on this map with those of the 1988 fires (p. 98). So far, the large fires of the 21st century are burning in areas largely unaffected by the 1988 fires. Ongoing research is showing that areas of stand-replacing fires can affect future fire behavior for up to 200 years.

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Managing Fire

History

- For the first 100 years of the park's existence, managers believed fires had to be extinguished to preserve park resources.
- Scientific research revealed:

—fires have occurred in Yellowstone for as long as there has been vegetation to burn

—fire plays a role in creating the vegetation patterns of the landscape

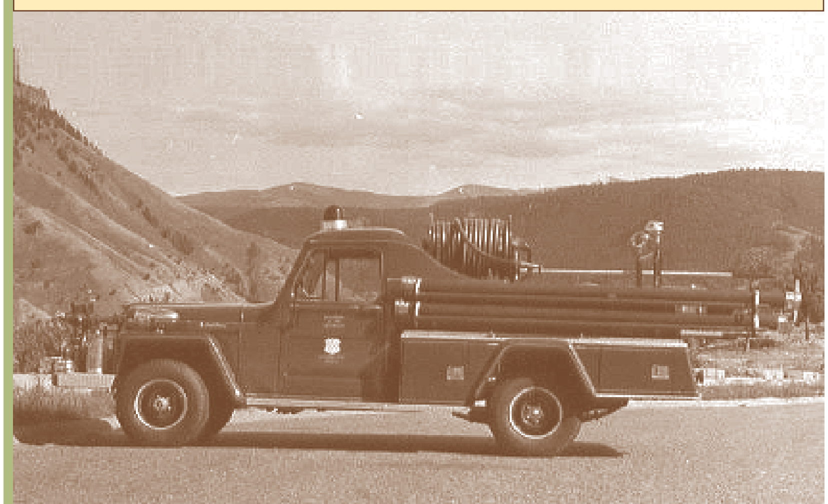
—fire is a part of the ecosystem that park managers want to preserve

—suppressing fires alters the natural landscape and diminishes diversity.

- 1972, Yellowstone began using natural fire management.
- Between 1972 and 2005, 397 natural, unsuppressed fires burned 66,354 acres—mostly in 3 dry years: 1979, 1981, 1988. (In 1988, natural fires were allowed to burn in early summer. See page 94.)
- The fires of 1988 brought about management changes, as did subsequent major fire seasons in this region.

Current Fire Management Policy

Yellowstone National Park follows guidelines of the 2003 Federal Wildland Fire Policy, which allows firefighters to manage fires for multiple objectives.



This old fire truck was pressed into use during the 1988 fires. Fire management policy, like the equipment, has been updated many times since that fiery year.

Fire suppression in Yellowstone National Park began with the arrival of the U.S. Army, which was placed in charge of protecting the park in 1886. The Army, which was in Yellowstone until 1918, successfully extinguished some fires, though the effect of their efforts on overall fire frequency or extent of fires cannot be fully determined. Their efforts are detectable on the northern range, where fire suppression allowed more trees to become established.

Post World War II

Reliable and consistent fire suppression began when modern airborne firefighting techniques became available after World War Two. Fire suppression continued until 1972. In that year, Yellowstone and several other national parks initiated programs allowing some natural fires to run their courses. Two backcountry areas in the park totaling 340,000 acres were designated as locations where natural fires could burn.

In 1976, the park's program expanded to 1,700,000 acres. Shortly thereafter, Yellowstone National Park and Bridger–Teton National Forest entered into a cooperative program allowing naturally caused fires in the Teton Wilderness to burn across the boundary between the two federal units.

In the years following, Yellowstone's fire management plan was revised and updated to meet National Park Service guidelines as research provided new information about fire behavior in the park. By 1985, cooperative agreements were in place within the greater Yellowstone area to allow natural fires to burn across the public land boundaries. Yellowstone's fire managers began revising the park's fire management plan. The new plan permitted some lightning-caused fires to burn under natural conditions; provided for suppressing fires that threatened human life, property, special natural features and historic and cultural sites; and recommended prescribed burns when and where necessary and practical to reduce hazardous fuels. It was in the final stages of approval in spring 1988.

Late 20th Century Reviews

Yellowstone's "new" fire policy was suspended during the summer of 1988. *(See following pages.)* After the fires of that summer, a national policy review team examined the national fire policy again, and concluded that natural fire policies in national parks and wilderness areas were basically sound. It also recommended improvements that were incorporated into the National Park Service's fire policy of June 1990 and into Yellowstone National Park's fire management plan of 1992.

Other major reviews occurred after the fire seasons of 1994 and 2000.

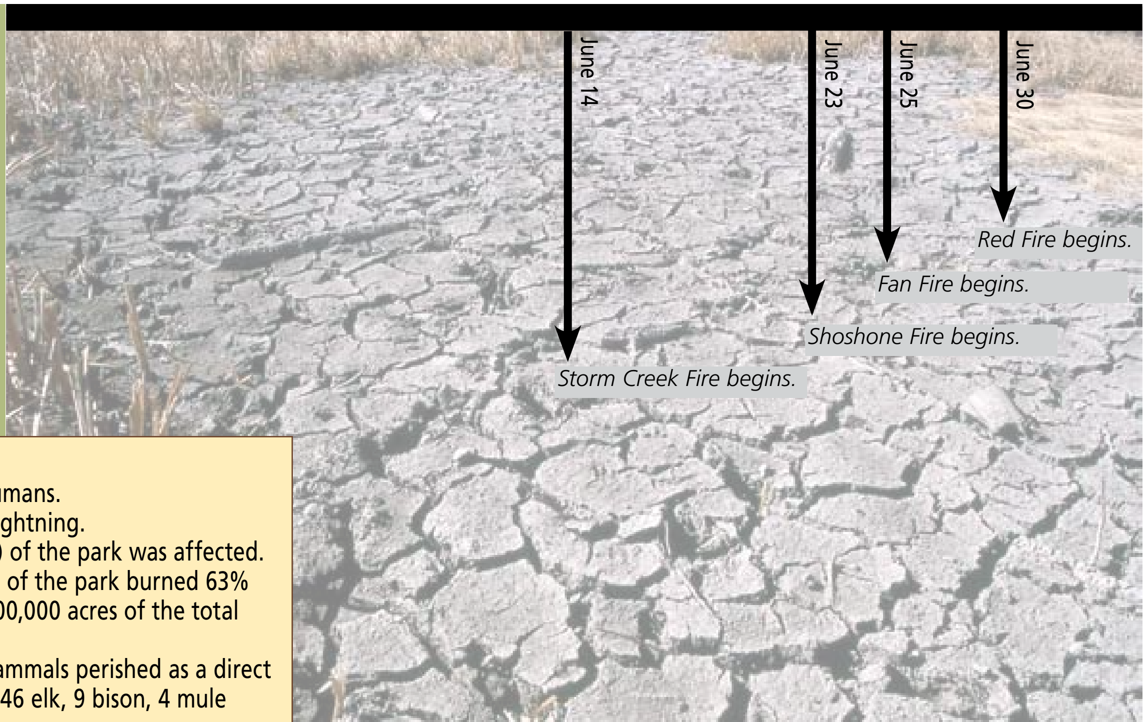
Fire Management Today in the Greater Yellowstone Ecosystem

Today, Yellowstone National Park operates under the 2003 Federal Wildland Fire Policy, which continues to evolve with experience and new knowledge. For example, current guidelines allow firefighters to manage a natural fire for multiple objectives. In the past, fires were required to be categorized as "suppression" or "fire-use for resource benefit." Now, firefighters can suppress one flank of a fire to protect structures and people while allowing another flank to burn to achieve natural fire benefits.

The LeHardy fire of 2008 was an example of managing a fire for multiple objectives. It was suppressed on its west and south flanks to protect power lines, the Fishing Bridge area, and to protect people using the roads. It was monitored, but not suppressed, as it moved north away from developed areas. Backcountry ranger cabins and research equipment in its path were wrapped in a material similar to a fire shelter to protect them from the heat.

A similar strategy was used in the 2009 Arnica Fire, which burned in 300-year-old lodgepole pine but threatened visitor travel, power lines, and Lake Village.

Wildland fire is a great example of inter-agency cooperation and coordination. Federal agencies, state and local governments, and private contractors all play a role in managing fire here the park. For example, the NPS relies on Forest Service smoke-jumpers to monitor or fight the park's remote fires. In return, the NPS sends its helicopter or engine to the Silver Gate or Cooke City areas, which are located on or adjacent to the Gallatin and Shoshone national forests. In 2009, the park's wildland engine was staffed by both NPS and Forest Service firefighters. Programmable radios ensure communication between NPS and Forest Service dispatch, which provides for firefighter safety. The NPS is also working with its partners to develop Community Wildfire Protection Plans that help in the pre-planning and preparing for a wildland fire that may threaten homes.



Statistics

- 9 fires caused by humans.
- 42 fires caused by lightning.
- 36% (793,880 acres) of the park was affected.
- Fires begun outside of the park burned 63% or approximately 500,000 acres of the total acreage.
- About 300 large mammals perished as a direct result of the fires: 246 elk, 9 bison, 4 mule deer, 2 moose.
- $120 million spent fighting the fires.
- 25,000 people involved in these efforts.

Fighting the Fires

- Until July 15, park managers followed the policy to let naturally-caused fires burn.
- Beginning July 15, park managers suspended the natural fire policy and began suppressing new natural fires.
- After July 21, park managers began fighting all fires, including natural fires that had been allowed to burn.
- The 1988 fires comprised the largest fire-fighting effort in the United States at that time.
- Effort saved human life and property, but had little impact on the fires themselves.
- Rain and snow in September finally stopped the advance of the fires.

The spring of 1988 was wet until June, when hardly any rain fell. Park managers and fire behavior specialists expected that July would be wet, though, as it had been historically *(see chart below)*. They allowed 18 lightning-caused fires to burn after evaluating them, according to the fire management plan. Eleven of these fires burned themselves out, behaving like many fires had in previous years.

Rains did not come in July as expected. By late July, after almost two months of little rain, the moisture content of grasses and small branches reached levels as low as 2 or 3 percent, and downed trees were as low as 7 percent (kiln-dried lumber is 12 percent). *(See page 90.)* In addition, a series of unusually high winds fanned flames that even in the dry conditions would not have moved with great speed.

Because of the extremely dry conditions, after July 15 no new natural fires were allowed to burn except those started adjacent to existing fires and that were clearly going to burn into existing fires. Even so, within a week the fire acreage in the park doubled to about 17,000 acres. After July 21, all fires—including those started naturally—were fully suppressed as staffing would allow. (Human-caused fires had been suppressed from the beginning.) On July 27, during a visit to Yellowstone, the Secretary of the Interior reaffirmed that all fires would be fought, regardless of their origin.

THE YEAR THE RAINS FAILED

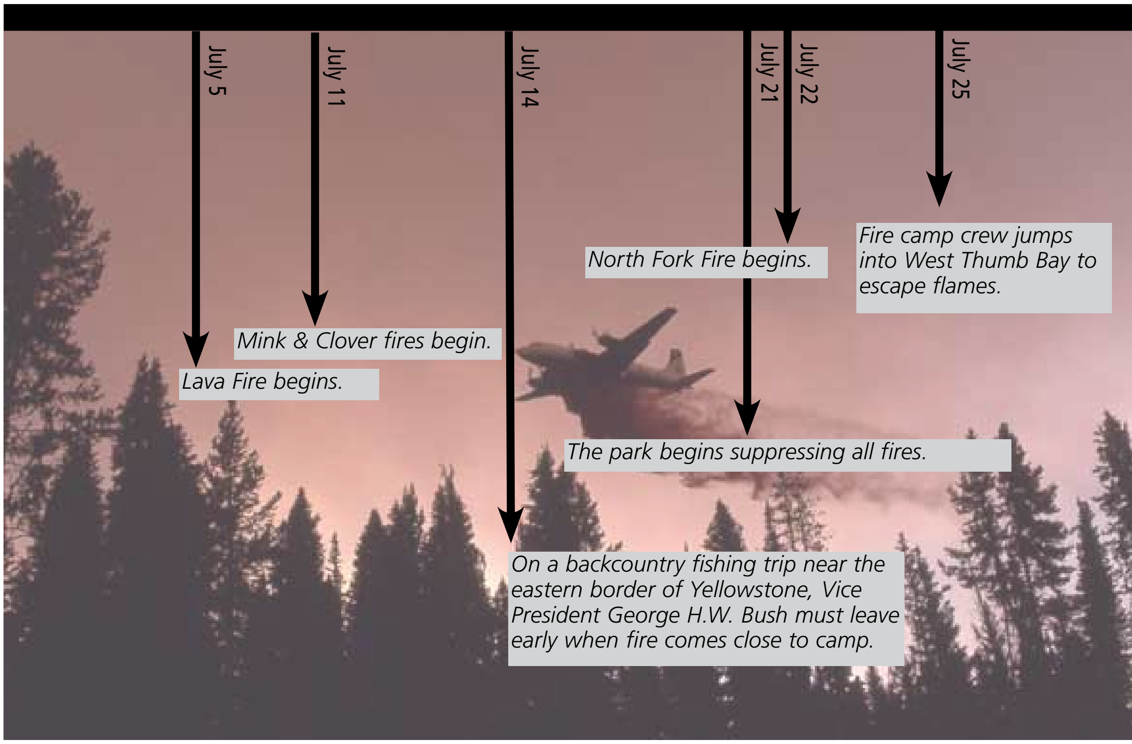
Percent of Normal Rainfall Mammoth Hot Springs

	April	May	June	July	Aug.
1977	10	96	63	195	163
1978	91	126	42	99	46
1979	6	17	42	115	151
1980	33	152	55	143	199
1981	49	176	102	103	25
1982	169	74	89	118	163
1983	22	29	69	269	88
1984	44	84	66	297	121
1985	42	93	44	160	84
1986	145	47	64	212	75
1987	42	144	75	303	122
1988	155	181	20	79	10

Fighting the Fires

An extensive interagency fire suppression effort was initiated in mid-July in the greater Yellowstone area in an attempt to control or contain this unprecedented series of wildfires. The extreme weather conditions and heavy, dry fuel accumulations presented even the most skilled professional firefighters with conditions rarely observed.

Accepted firefighting techniques were often ineffective because fires spread long



distances by “spotting,” a phenomenon in which wind carries embers across unburned forest to start spot fires ahead of the main fire. In the severe conditions of 1988, fires were spotting up to a mile and a half ahead—jumping bulldozer lines, roads, rivers, even the Grand Canyon of the Yellowstone River.

Fires often moved two miles per hour, with common daily advances of five to ten miles. The fast movement, coupled with spotting, made direct attacks on the fires impossibly dangerous, as fire crews could easily be overrun or trapped between a main fire and its outlying spot fires. Even during the night, fires could not be fought. Typically, wildfires “lie down” at night as humidity increases and temperature decreases. But in 1988, the humidity remained low at night, and fire fighting was complicated by the danger of falling trees.

Firefighting efforts were directed at controlling the flanks of fires and protecting lives and property in their paths. The fire experts on site generally agreed that only rain or snow could stop the fires. They were right: one-quarter inch of snow on September 11 stopped the advance of the fires.

By the last week in September, about 50 lightning-caused fires had occurred in or burned into the park, but only eight were still burning. More than $120,000,000 had been spent in control efforts on fires in the greater Yellowstone area, and most major park developments—and a few surrounding communities—had been evacuated at least once as fires approached within a few miles. The fire suppression efforts involved many different federal and state agencies, including the armed forces. At the height of the fires, ten thousand people were involved. This was the largest such cooperative effort ever undertaken in the United States.

Confusion in the Media

The Yellowstone fires of 1988 received more national attention than any other event in the history of national parks up to that time. Unfortunately, many media reports were inaccurate or misleading and confused or alarmed the public. The reports tended to lump all fires in the Yellowstone area together as the “Yellowstone Park Fire”; they referred to these fires as part of the park’s natural fire program, which was not true; and they often oversimplified events and exaggerated how many acres had burned. In Yellowstone National Park itself, the fires affected—but did not “devastate”—793,880 acres or 36 percent of total park acreage.

A number of major fires started outside the park. These fires accounted for more than half of the total acres burned in the greater Yellowstone area, and included most of the fires that received intensive media attention. The North Fork Fire began in the Targhee National Forest and suppression attempts began immediately. The Storm Creek Fire started as a lightning strike in the

Absaroka–Beartooth Wilderness of the Custer National Forest northeast of Yellowstone; it eventually threatened the Cooke City–Silver Gate area, where it received extended national media coverage.

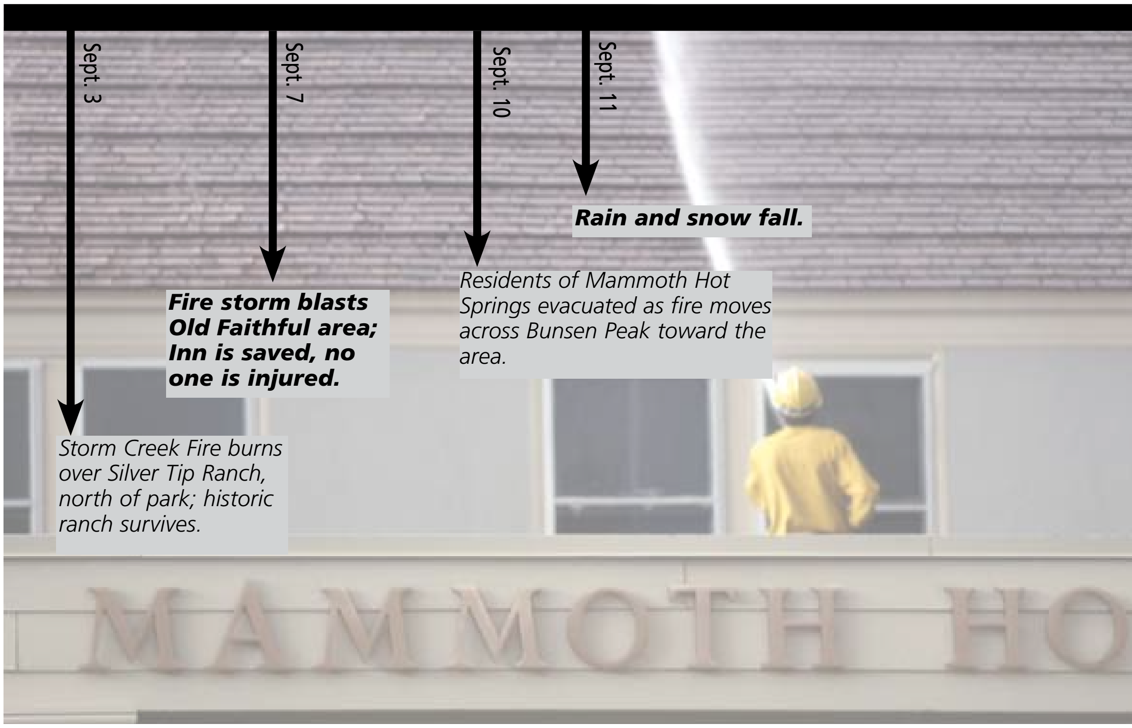
Additional confusion resulted from the mistaken belief that managers in the Yellowstone area let park fires continue burning unchecked because of the natural fire plan—long after such fires were being

fought. Confusion was probably heightened by misunderstandings about how fires are fought: if crews were observed letting a fire burn, casual observers might think the burn was merely being monitored. In fact, in many instances, fire bosses recognized the hopelessness of stopping fires and concentrated their efforts on protecting developed areas.

The most unfortunate public and media misconception about the Yellowstone firefighting effort may have been that human beings can always control fire. These fires could not be controlled; their raw, unbridled power cannot be overemphasized. Firefighters were compelled to choose their fights very carefully, and they deserve great praise for working so successfully to save all but a few park buildings.

Post-fire Response and Ecological Consequences

By late September, as the fires were diminishing, plans were already underway in Yellowstone to develop comprehensive programs for all aspects of post-fire response. These included replacing, rehabilitating, or repairing damaged buildings, power lines, firelines, trails, campsites, and other facilities. Interpretive rangers developed programs to interpret the fires and their effects for visitors and for the general public. Other interpretive specialists developed indoor and outdoor exhibits, publications, and trails to help visitors learn about these historic fires. The park also cooperated with



other agencies and state and local governments in promoting the economic recovery of communities near the park that were affected by the fires.

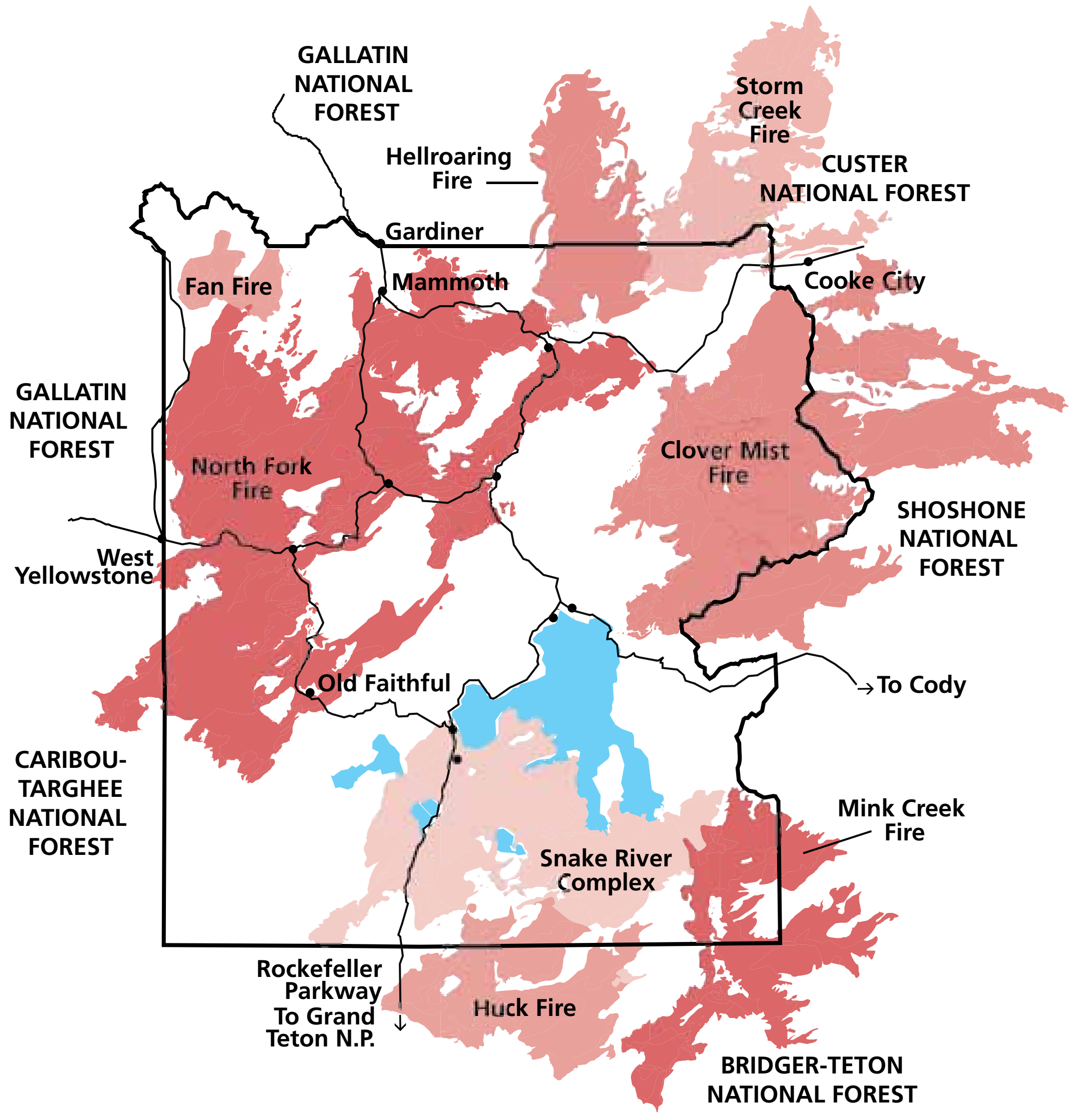
Scientists wanted to monitor the ecological processes following these major fires. The National Park Service cooperated with other agencies and independent researchers and institutions in developing comprehensive research directions for this unparalleled scientific opportunity. Observations began while the fires were still burning, when it was apparent that the fires did not annihilate all life forms in their paths.

Burning at a variety of intensities, the fires killed many lodgepole pines and other trees, but did not kill most other plants; they merely burned the tops, leaving roots to regenerate. Temperatures high enough to kill deep roots occurred in less than one-tenth of one percent of the park. Only under logs and in deep litter accumulations, where the fire was able to burn for several hours, did lethal heat penetrate more deeply into the soil. Where water was available, new plant growth began within a few days. In dry soils, the rhizomes, bulbs, seeds, and other reproductive tissues had to wait until soil moisture was replenished the following spring.

Though animal movements were sometimes affected dramatically by the passage of fires, relatively few animals died. However, portions of the northern range burned, which affected winter survival of grazing animals when coupled with summer drought conditions. In this and many other ways, fires dramatically altered the habitat and food production of Yellowstone for the short term.

The fires of 1988 created a landscape of burns, partial burns, and unburned areas—called a mosaic. A mosaic provides natural firebreaks and sustains a greater variety of plant and animal species. Vegetation capable of sustaining another major fire will be rare for decades, except in extraordinary situations.

This map uses colors only to help you see fire boundaries. The colors do not indicate intensity, duration, or anything else.



Burned Area Within Yellowstone National Park

Burn Type	Acres	Percent of Park
• Crown fire: consuming the forest canopy, needles, and ground cover and debris	323,291	15%
• Mixed: mixture of burn types in areas where most of ground surface was burned	281,098	13%
• Meadows, sagebrush, grassland	51,301	2%
• Undifferentiated: variety of burn types	37,202	2%
• Undelineated: surface burns not detectable by satellite because under unburned canopy	100,988	4%
Total Burned Area	**793,880**	**36%**
Total Unburned Area	**1,427,920**	**64%**

Data from the Geographic Information Systems Laboratory, Yellowstone National Park, 1989; Table adapted from Yellowstone in the Afterglow: Lessons From the Fires, *Mary Ann Franke, 2000.*

6

After the 1988 Fires

In 2000, The Yellowstone Center for Resources published Yellowstone in the Afterglow: Lessons from the Fires, *by Mary Ann Franke. Some findings are summarized here.*

Soils

Fertile soils with good water-holding capacity that have a dense, diverse vegetation before the fire were likely to respond quickly after the fire with a variety of species and nearly complete cover. Some soils in Yellowstone supported little vegetation before the fires and have continued to have little since then. Areas that appear barren and highly erosive did not necessarily become that way because of fire.

Trees

As root systems of standing dead trees decay and lose their grip on the soil, the trees are gradually falling down, often with the help of a strong wind. However, many will remain upright for decades.

Many forests that burned in 1988 were mature lodgepole stands, and this species recolonized most burned areas. Other species —such as Engelmann spruce, subalpine fir, and Douglas-fir—have also emerged.

The density of lodgepole pine seedlings in burned areas after the 1988 fires varied, depending on factors such as fire severity, elevation, abundance of serotinous cones (which require fire to open), and seedbed characteristics. Density ranged from 80 seedlings per hectare in a high-elevation stand with no serotinous cones to 1.9 million seedlings per hectare in a low-elevation stand in which nearly half the trees had serotinous cones. (One hectare is approximately 2.5 acres.)

About 24 percent of the park's whitebark pine forest burned in 1988. This affects grizzly bears, for which whitebark pine seeds are an important food in fall. Seeds not consumed by grizzlies remain in caches of red squirrels and Clark's nutcracker.

What Did *NOT* Happen

Many predictions were made about the 1988 fires' long-term consequences for visitation, wildlife, and vegetation. However, the following have not come to pass:

- ✗ *A long-term drop in park visitation.*
- ✗ *Flooding downstream of the park because of increased runoff on bare slopes.*
- ✗ *A decline in fish populations because increased erosion silted up the water.*
- ✗ *An increase in fish populations in smaller streams where deforestation and loss of shade could result in warmer water and higher nutrient levels.*
- ✗ *More rapid invasion of non-native plants into burned areas and corridors cleared as fire breaks.*
- ✗ *An increase in lynx following a boom in snowshoe hares as a result of changes in forest structure.*
- ✗ *An increase in the elk population because of improved forage.*
- ✗ *A decline in the endangered grizzly bear population because of smaller whitebark pine seed crops.*
- ✗ *Another big fire season in Yellowstone because of all the fuel provided by so many dead and downed trees.*

What *DID* Change

These changes have been caused entirely or in part by the fires of 1988:

- ✓ *The replacement of thousands of acres of forest with standing or fallen snags and millions of lodgepole pine seedlings.*
- ✓ *The establishment of aspen seedlings in areas of the park where aspen had not previously existed.*
- ✓ *A decline in the moose population because of the loss of old growth forest.*
- ✓ *Shifts in stream channels as a result of debris flows from burned slopes.*
- ✓ *An increase in the public understanding and acceptance of the role of fire in wildland areas.*
- ✓ *A program to reduce hazardous fuels around developed areas.*

The most recent research was presented September 2008 at the 9th Biennial Scientific Conference, "The '88 Fires: Yellowstone & Beyond."

These buried seeds and the hardiness of whitebark pine seedlings on exposed sites give this tree an initial advantage in large burned areas over conifers dependent on wind to disperse seeds. However, this slow-growing and long-lived tree is typically more than 50 years old before producing cones. The young trees may die before reproducing if the interval between fires is too short or if faster-growing conifers overtake them. By 1995, whitebark pine seedlings had appeared in all 275 study plots, though density was not significantly different between burned and unburned sites.

About one-third of the aspen in the northern range burned in the 1988 fires—but the aspen stands were not destroyed. Fire that killed adult stems also enhanced aspen reproduction. Like other disturbances, fire stimulates the growth of suckers from the aspen's extensive underground root system. (Suckers and root shoots produce clones of the "parent" aspen.) Fire also leaves bare mineral soil devoid of taller plants—perfect conditions for aspen seedlings. After the fires of 1988, aspen seedlings appeared throughout the park's burned areas. All the young trees, whether clones or seedlings, can be heavily browsed by elk and may not grow much beyond shrub height. But the fires indirectly helped protect some of these young trees: the trunks of fallen trees keep elk from reaching some young aspen.

Other Vegetation

The regrowth of plant communities began as soon as the fire was gone and moisture was available, which in some sites was within days. In dry soils, the seeds had to wait until moisture was replenished the following spring. New seedlings grew even in the few areas where the soil had burned intensely enough to become sterilized. Within a few years, grasslands had largely returned to their pre-fire appearance. Sagebrush also recovered rapidly.

Plant growth was unusually lush in the first years after the fires because of the mineral nutrients in the ash and increased sunlight on the forest floor. Moss an inch or more thick became established in burned soils, and may have been a factor in moisture retention, promoting revegetation and slowing erosion.

Wildlife

Most ungulate (hoofed) species were more affected by the drought and the relatively severe winter that followed than by the fires. Although none of their winter range burned, mule deer declined 19 percent and pronghorn 29 percent during the winter of 1988.

Elk mortality rose to about 40 percent in the winter of 1988–89, but scientists are unsure how much of this was due to reduced forage because of the fires. (At least 15 percent of the deaths were due to hunting seasons outside the park.) Even without the fires, several factors would probably have led to high elk mortality that winter: summer drought, herd density, hunting harvest, and winter severity. The greatest impact of the fires would therefore be on the quantity and quality of forage available to elk in subsequent years. A two-year study following the fires found that the forage quality of three types of grasses was better at burned sites than unburned sites.

Of the 38 grizzly bears wearing radio transmitters when the fires began, 21 had home ranges burned by one or more of the fires: 13 of these bears moved into burned areas after the fire front had passed, three bears (adult females without young) stayed within active burns as the fire progressed, three bears remained outside the burn lines at all times, and two adult females could not be located. In a study from 1989–92, bears were found grazing more frequently at burned than unburned sites, especially on clover and fireweed. Even though bear feeding activity in some whitebark pine areas decreased as much as 63 percent, the fires

The 1988 fires presented an unprecedented opportunity to study the landscape-scale ecological effects of an infrequent natural disturbance—a large, severe fire in this case—in an ecological system minimally affected by humans.

Monica Turner, 9th Biennial Scientific Conference, "The '88 Fires: Yellowstone & Beyond"

had no discernible impact on the number of grizzly bears in greater Yellowstone.

Rodents probably had the highest fire-related mortality of any mammals. Although many could escape the fires in burrows, others died of suffocation as the fires came through. They also were more exposed to predators because they had lost the cover of grasses and other plants. But, because of their capacity to have multiple litters with many young per year, rodents quickly repopulated burned areas.

Most birds were not directly harmed by the fires and some benefited. For example, raptors hunted rodents fleeing the fires. But young osprey that were still in their nests died. Post-fire habitat changes helped some birds. Cavity-nesting birds, such as Barrow's goldeneye, flickers, and bluebirds had many dead trees for their nests. Robins and flickers found ants and worms more easily. Boreal owls, however, lost some of the mature forests they need.

Aquatic Resources

In general, the amount of soil loss and sediment deposits in streams varied greatly, but in most cases were considered normal.

About a quarter of the Yellowstone Lake and Lewis Lake watersheds and half of the Heart Lake watershed burned to some extent, but no significant changes were observed in nutrient enrichment, plankton production, or fish growth afterward. No apparent streambank erosion or other changes occured that affected cutthroat trout spawning habitat, nor did the number of spawning streams decline. No discernible fire-related effects have been observed in the fish populations or the angling experience in the six rivers that have been monitored regularly since 1988.

In other park watersheds, such as the Gibbon River, massive erosion and mudslides occurred during and after the heavy rains of the summer of 1989. Scientists don't know how much the fires of 1988 facilitated these events. However, by 1991, growth of plants had slowed this erosion.

Conclusion

In the first years after a major fire, new vistas appear while the lush growth of new, young trees emerges from the burned ground. Today, more than twenty years after the 1988 fires, those young trees are renewed forests, once again filling in vistas. Some visitors still feel that the Yellowstone they knew and loved is gone forever. But Yellowstone is not a museum—it is a functioning ecosystem in which fire plays a vital role.

Yellowstone's park photographer established "photo points," or specific locations, to be photographed in 1988 and in subsequent years. This set shows a pond along the road between Canyon and Norris junctions, as it appeared in 1988 (above) and 1989 (below).

6

For More Information

www.nps.gov/yell

www.greateryellowstone-science.org/index.html

Yellowstone Science, free from the Yellowstone Center for Resources, in the Yellowstone Research Library, or online at www.nps.gov/yell

Yellowstone Today, distributed at entrance gates and visitor centers.

Site Bulletins, published as needed, provide more detailed information on park topics such as history and geology. Free; available upon request from visitor centers.

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